

NEW SIPHONAPTERA FROM CALIFORNIA

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Family PULICIDÆ

Anomiopsyllus congruens Stewart, new species

This species is apparently most closely related to *A. falsicalifornicus* Fox, 1929.

Head. Labial palpi slightly exceeding fore-coxæ in length and a trifle shorter than maxillary palpi. Frontal tubercle located high up on the frons. Frontal row composed of three bristles; one of which is located on anterior margin of antennal groove, one on oral margin and the third half way between the other two. Maxillæ subacutely pointed distally. *Abdomen.* First abdominal tergite with three dorsal teeth on each side. Second tergite with but one tooth on each side.

In other respects this new species is like the other known representatives of the genus except for the modified segments. *Modified Segments.* Male. Movable process of claspers convex on anterior margin and rather symmetrically proportioned; there is no distal dilation as in *A. falsicalifornicus*. Distally this process bears a more or less horizontal row of three closely set teeth which is less oblique and with the teeth not so widely separated from one another as in *falsicalifornicus* (Fig. 1). Also with a smaller tooth on proximal posterior margin. One apparently aberrant male in our series with a fourth very small tooth on the clasper located below the inner tooth and in this same specimen with the proximal tooth moved upwards. A row of fine bristles on posterior margin of movable clasper. Tip of manubrium acutely pointed and bent dorsad. Ninth sternite truncate at tip; possessing two prominent teeth at ventro-posterior angle and with a row of about seven bristles slightly more than half-way up the horizontal arm. Female. Stylet acutely pointed with one long apical bristle; about three times as long as broad at base. Substylar flap also acutely pointed and clothed with numerous long, fine bristles. Spermatheca with a spherical body and a relatively thick tail. Seventh sternite broadly and evenly rounded on posterior margin and quite constant in contour (Fig. 2).

The holotype, a male, and the allotype were collected at the Frances Simes Hastings Natural History Reservation near Jamesburg, Monterey County, California, from *Spilogale gracilis* subsp. on November 19, 1938, by R. Holdenreid. The paratypes consist of thirty-five males and thirty-five females, with the same data as the types, two females collected from *Pero-*

myscus californicus subsp. at the same place on December 17, 1938, and January 5, 1939, by the same collector and one male and six females from *Neotoma fuscipes* subsp. at the same place collected by C. P. North on June 20, 1938. The holotype and allotype are deposited in the author's collection.

Hoplopsyllus tenuidigitus Stewart, new species

This species is known only from male specimens.

Head. Labial palpus reaching to about three-fourths the length of fore-coxæ. *Thorax.* Pronotal ctenidium composed of sixteen or seventeen spines. Chætotaxy of metepisternum and metepimeron variable. *Legs.* Longest apical bristle of first metatarsal segment as long as second segment. Longest apical bristle of second metatarsal segment as long as third, fourth and fifth segments together. *Modified Segments.* Upper process of immovable claspers bearing eight long, stout and very closely-set bristles on dorsal and anterior margins. Lower process very long and slender, being nine and one-half times as long as broad at base. Distal tooth of this process nearly one-fifth as long as the entire process; very heavily chitinized and about as wide as the rest of the process. This latter process with four long, thin bristles on distal half of its posterior margin (Fig. 3). Movable process of the claspers inconspicuous and somewhat lanceolate in shape. Ninth sternite dilated distally, broadly rounded at apex and bearing a single stout, curved spine and several short, stout bristles. Manubrium short, stout, curved dorsad and cut at an angle at the tip.

The holotype, which is deposited in the author's collection, was collected at the Frances Simes Hastings Natural History Reservation near Jamesburg, Monterey County, California, from *Sylvilagus audubonii* subsp. on July 4, 1938, by C. P. North. Two male paratypes were taken at the same place from the same host species on July 4, 1938, and July 5, 1938, also by Mr. North.

Family DOLICHOPSYLLIDÆ

Subfamily CTENOPHTHALMINÆ

Atheropsylla Stewart, new genus

Readily distinguished from other known Dolichopsyllidæ by the character of its genal ctenidium, which consists of two spines located on anterior margin of antennal groove just beneath vestigial eye and inserted one above the other in such a way as to be strongly overlapping and nearly parallel to one another (Fig. 4). Antennal groove extending very high up on occiput. No

frontal notch or tubercle present. Frontal angle located high up on frons. Labial palpi slender and five-segmented. *Thorax*. Pronotal ctenidium composed of about fourteen spines. *Abdomen*. Three rows of stout bristles on each of the first seven abdominal tergites. The two posterior rows extending below stigmata. Three antepygidial bristles present on each side in both sexes. *Legs*. Four pairs of lateral plantar bristles and one pair of proximal median ones on fifth tarsal segment of all legs.

Genotype: *Atheropsylla bakeri* Stewart.

Atheropsylla bakeri Stewart, new species

Head. Frons short, sharply angled dorsally and nearly vertical below the angle (Fig. 4). Lower frontal row composed of three bristles and upper row of two very small, fine bristles. Above and behind the eye, on margin of antennal groove, an additional long bristle. Labial palpi reaching nearly to end of fore-coxæ. Maxillary palpi nearly as long as labial palpi. Occiput markedly indented above antennal groove. A patch of very small hairs back of antennal groove. One occipital bristle behind first antennal segment and another behind second segment. Above the former there is one smaller bristle and above the latter are three smaller bristles. *Thorax*. Pronotal ctenidium composed of thirteen or fourteen spines. Mesosternum, metepisternum and metepimeron heavily bristled but the number of bristles and their arrangement are inconstant. *Abdomen*. Third to seventh abdominal sternites with a posterior row of three bristles on each side of the body and in front of these one or two small bristles. No dorsal teeth on abdominal tergites. Upper antepygidial bristle of each group shortest and the middle one longest. *Legs*. An oblique row of small spinelets about half way up inner side of anterior margin of metacoxa. Longest apical metatibial bristle equaling first metatarsal segment in length. Longest apical bristle of first metatarsal segment extending to apex of second segment. Longest apical bristle of second metatarsal segment equaling third and fourth segments together in length. Longest apical bristle of third metatarsal segment reaching to about one-half the length of fifth segment. *Modified Segments*. Male. Movable process of claspers symmetrically digitate, its posterior margin bearing a conspicuous row of fine bristles. This process extends a considerable distance beyond immovable process (Fig. 5). Immovable process very broad. Manubrium extremely narrow and long. Ninth sternite broad and very broadly rounded at apex, possessing two spine-like bristles (the more distal of which is broken off in the holotype) on distal ventral margin. Remainder of ventral margin clothed with a row of fine bristles. Vertical arm of ninth sternite broad and dilated proximally. Female. Body of spermatheca roughly rectangular; tail long and dilated close to body

(Fig. 6). Bursa copulatrix heavily chitinized and strongly bent anteriorly. Stylet about five times as long as wide at base and with a long apical bristle. Posterior margin of seventh sternite deeply and evenly concave; its upper lobe acutely angled.

The holotype, a male, and the allotype, both of which are deposited in the author's collection, as well as three male and two female paratypes were collected at the Frances Simes Hastings Natural History Reservation, near Jamesburg, Monterey County, California, from *Dipodomys venustus* subsp. on June 30, 1939, by C. P. North. Another male paratype was taken from the same host species in the same place by Mr. North, on June 12, 1938, and a female paratype from *Neotoma fuscipes* subsp. on June 20, 1938.

This new species is named in honor of the late Professor C. F. Baker, who was the first American siphonapterist.

Subfamily DOLICHOPSYLLINÆ

Foxella ignotus acutus Stewart, new subspecies

As would be expected, this new subspecies appears to be most closely related to *F. ignotus franciscanus* (Roths.), 1910.

Head. Lower genal row composed of three stout bristles; upper genal row with five bristles in the male and four in the female. Labial palpi extending to about three-fourths the length of fore-coxæ. There is one long bristle on the occiput behind middle of antennal groove. *Thorax.* Pronotal ctenidium composed of twenty spines. *Legs.* Longest apical bristle of first metatarsal segment as long as second segment. Longest apical bristle of second metatarsal segment extending to nearly one-half the length of fifth segment. *Modified Segments.* This subspecies is very readily distinguished from all other subspecies of *ignotus* by its modified segments. *Male.* Eighth tergite bearing about twenty-two stout bristles. Movable process of claspers long, slender and subacutely pointed at tip (Fig. 7). Immobile process of claspers somewhat conical in shape and extending slightly more than half way up the movable process. Ninth sternite long and both its anterior and posterior lobes bearing numerous bristles. Eighth sternite without a long apical or subapical bristle; however, with a distal clump of four stout bristles on ventral margin, anterior to which is another clump of four smaller bristles. Apex of eighth sternite symmetrically and acutely pointed; tip of vertical arm of this sternite evenly rounded and without an attenuated, dorsal projection. *Female.* Body of spermatheca spherical in shape and tail long and stout (Fig. 8). Stylet about twice as long as broad at base, acutely pointed, bearing a long apical bristle

and a somewhat shorter subapical one on ventral margin. Sub-stylar flap heavily bristled. Posterior margin of seventh sternite of irregular outline in the dorso-posterior region (Fig. 8) and from there sloping regularly antero-dorsally.

The holotype, a male, and the allotype, both of which are deposited in the author's collection, were collected at the Frances Simes Hastings Natural History Reservation, near Jamesburg, Monterey County, California, from *Thomomys bottæ* subsp. on May 26, 1938, by C. P. North. Only these two specimens are known.

Family HYSTRICHOPSYLLIDÆ

Atyphloceras longipalpus Stewart, new species

This species appears to be more closely related to *A. felix* Jordan, 1933, than to any other known representative of the genus.

Head. Labial palpi with more segments than in any previously described species: nine in the female and eight in one palpus and nine in the other in the male. These palpi extending beyond fore-trochantera. Three rows of frontal bristles. Maxillary palpi nearly as long as labial palpi. Maxillæ long and acutely pointed. Frontal tubercle about even with anterior bristle of upper frontal row. *Thorax.* Pronotal ctenidium composed of twenty or twenty-one spines. *Abdomen.* Number of dorsal teeth on abdominal tergites (the two sides together) as follows: In the male, seven bristles on first tergite; ten on second; ten on third; eight on fourth; seven on fifth; and six on sixth. In the female, six bristles on first tergite; ten on second; eight on third; seven on fourth; eight on fifth; and two on sixth.

Aside from these characters and differences in the modified segments, this species is very similar to the other known species of the genus.

Modified Segments. Male. Both margins of movable process of claspers above pedicel slightly convex; apex bluntly rounded and posterior margin bearing four long bristles (Fig. 9). Im-movable process cone-shaped and bearing eight stout bristles. Manubrium attenuated and acutely pointed. Horizontal arm of ninth sternite shaped somewhat like a bean-pod and bearing two short, stout, sharply pointed bristles on postero-ventral margin. Female. Spermathecae very similar to those of *A. echis* Jordan and Rothschild, 1915, but with shorter tails (Fig. 10). Dilated portion of bursa copulatrix roughly rectangular in shape. Posterior margin of seventh sternite possessing a conspicuous ventral lobe broadly rounded at its upper angle and very slightly convex

at its posterior margin. Stylet two and one-half times as long as broad at base and only slightly narrowed at tip. Eighth tergite with eight spine-like bristles.

The holotype, a male, and the allotype (the only specimens known), which are deposited in the author's collection, were collected at the Frances Simes Hastings Natural History Reservation near Jamesburg, Monterey County, California, from *Spilogale gracilis* subsp. on November 19, 1938, by R. Holdenreid.

ATYPHLOCERAS FELIX Jordan

Atyphoceras [sic!] *felix* Jordan, Novitates Zoologicae, 39:69, 1 fig., 1933.

Only the male of this species was described by Jordan. In his description it is stated that the labial palpus is seven-segmented. In our specimens the labial palpi of both the males and the females may have either seven or eight segments. We have in our collection twenty-two males and twenty-eight females collected at the Frances Simes Hastings Natural History Reservation, near Jamesburg, Monterey County, California, on *Peromyscus californicus* subsp., *P. truei* subsp. and *Microtus californicus* subsp. from June 18, 1938, to January 11, 1939. The female of this species is accordingly described below.

Head of spermatheca subglobular in shape and tail relatively stout (Fig. 11); thus closely resembling the female of *A. bishopi* Jordan, 1933. Dilated portion of bursa copulatrix shaped much like the pod of a bean, as in *bishopi*, but distorted at times in such a way as to give a somewhat triangular shape. Posterior margin of seventh sternite, in most of our specimens, with two well defined lobes; a lower one with a more or less straight margin rounded at upper corner and separated by a deep conspicuous sinus from the small rather acutely pointed upper lobe, this latter extending posteriorly nearly as far as lower lobe. Margin of this sternite variable, however. Upper lobe very sharply pointed in some specimens, rounded and much smaller in others and, in one specimen, lacking and thereby greatly resembling this segment in *A. longipalpus* Stewart. Eighth tergite with a vertical row of about six spine-like bristles, the lower four of which are very short. Stylet about three and one-half times as long as broad at base and only very slightly narrowed apically.

The allotype, which is deposited in the author's collection, was collected from *Peromyscus californicus* subsp. on June 18, 1938, by C. P. North.

Corypsylla setosifrons Stewart, new species

This species is described from a single female which is sufficiently distinct from all known representatives of the genus to warrant its description as a new species.

Head. Upper genal spine extending beyond anterior margin of antennal groove and broadly rounded at tip. Second spine about the same length as first spine (not longer as in *C. ornatus* Fox, 1908) and cut off obliquely at tip. Third genal spine slightly longer and also cut off at an angle at tip. Fourth spine longest, extending to prosternum, and greatly enlarged at tip which terminates in an acute angle. Fifth spine narrower than third and symmetrically pointed. Sixth genal spine as long as fifth; well defined and shaped much like a scimitar. With five bristles, rather than four as in *ornatus*, above upper genal spine. Also with five stout bristles on anterior margin of antennal groove. Labial palpus extending to four-fifths the length of fore-coxæ. Dorsally on each side of occiput with a somewhat oblique row of three bristles and a more posterior slightly oblique row of four bristles. With one conspicuous bristle back of basal segment of antenna and two bristles, the anterior of which is the smaller, posterior to club. *Thorax.* Pronotal ctenidium with sixteen normal spines and below it a continuation composed of nine shadowy spines on each side. Mesonotum very deeply concave on its ventral margin. Chætotaxy of mesothorax as in *ornatus*. Metepimeron bearing one anterior bristle and a row of four posterior bristles. *Abdomen.* Dorsal teeth on both sides of abdominal tergites as follows: First tergite, four teeth; second tergite, six teeth; third tergite, six teeth; fourth tergite, seven teeth; fifth tergite, six teeth; and sixth tergite, four teeth. Two bristles on second abdominal sternite, four on third, six on fourth, and six on fifth, sixth and seventh. *Modified Segments.* A vertical row of four bristles below antepygidial bristles. Eighth tergite bearing a vertical row of five bristles. With two horizontally arranged bristles on dorsal margin of eighth sternite. Posterior margin of seventh sternite curved concavely (Fig. 12). Spermatheca slightly vermiform and with the tail longer than body. Stylet long and cylindrical in shape.

The holotype, a female, which is deposited in the author's collection, was collected at the Frances Simes Hastings Natural History Reservation, near Jamesburg, Monterey County, California, on *Scapanus latimanus* subsp. on July 9, 1938, by C. P. North.

Trirachipsylla Stewart, new genus

Head. Easily distinguished from other known fracticipate fleas by the genal ctenidium of three spines, the more anterior

two of which overlap one another (Fig. 13). Two rows of frontal bristles with a large single bristle in between. Frontal tubercle present. Occiput bearing three rows of bristles. Eye present but lightly pigmented. Bristles of second antennal segment short. Maxillæ very acutely pointed. Last four segments of labial palpi short. *Abdomen.* First five abdominal tergites possessing dorsal teeth. With three antepygial bristles on each side of abdomen. *Legs.* Hind coxæ heavily clothed with fine hairs in apical half. Bristles on posterior margins of tibiæ arranged in groups of twos and threes. With four pairs of lateral plantar bristles and one median pair between first lateral pair on fifth tarsal segments of all legs.

Genotype: *Trirachipsylla digitiformis* Stewart.

Trirachipsylla digitiformis Stewart, new species

Head. Posterior genal spine much narrower than the two overlapping anterior spines. Genal process acutely pointed posteriorly. Eye lightly pigmented. Lower genal row composed of three stout bristles; the upper one of which is located above the eye. Upper genal row with five bristles. With a long, heavy bristle immediately below next to the upper bristle of the upper genal row and between the two genal rows. Occiput bearing three rows of bristles. Along posterior margin of antennal groove, extending from base of second antennal segment to apex of the groove, a thickly set row of very minute spine-like bristles. Maxillæ long and drawn out to a very fine point. Labial palpi five-segmented, strongly chitinized and extending to about two-thirds the length of fore-coxæ. *Thorax.* Pronotal ctenidium composed of sixteen spines, in front of which is a row of about ten long, stout bristles. Chætotaxy of metasternum, metepisternum and metepimeron variable. *Abdomen.* Bristles on abdominal tergites relatively long and stout. Arrangement of dorsal teeth on abdominal tergites as follows: Male, seven teeth on both sides together on first tergite, seven on second tergite, five on third tergite, six on fourth tergite, and two on fifth tergite; female, six teeth on first tergite, seven on second tergite, five on third tergite, and two each on fourth and fifth tergites. *Legs.* No spinelets on inner sides of hind coxæ but the apical halves bearing numerous short, fine bristles. Four pairs of lateral plantar bristles and a median pair between the first lateral pair on fifth tarsal segments of all legs. Longest apical bristle of second metatarsal segment about as long as third and fourth segments together. With numerous stout, lateral bristles on metatibiæ. *Modified Segments.* Male. Movable process of claspers long and symmetrically digitate, bearing four conspicuous bristles at ventro-posterior angle. Upper two of these bristles stoutest (Fig. 14). Immobile process of claspers bilobed. Lower lobe bearing three very fine bristles. Upper lobe with one long, stout bristle with a smaller bristle and

a hair above it and a smaller bristle below it. Manubrium sharply pointed and curved dorsad at tip. Eighth sternite narrow with one large bristle about mid-way on ventral border, five spine-like bristles distally and a clump of four bristles anterior to the latter. Female. Spermatheca large; head subspherical and tail stout and obliquely cut at tip (Fig. 15). Seventh sternite not incised on its posterior margin, which slopes regularly anteriorly. In one specimen in our collection this sternite is scalloped ventro-posteriorly. Stylet long and tapering toward the tip which is cut off squarely; with one long apical bristle. Substylar flap clothed with a few stout bristles.

The holotype, a male, was collected at the Frances Simes Hastings Natural History Reservation, near Jamesburg, Monterey County, California, from *Perognathus californicus* subsp. on November 9, 1938, and the allotype from the same host species at the same place on October 29, 1938, by R. Holdenreid. These are deposited in the author's collection. The paratypes consist of eighteen males and thirty females collected on *Perognathus californicus* subsp. from October 27, 1938, to December 7, 1938, and one female from *Peromyscus truei* subsp. on January 5, 1939. All of these paratypes were collected by Mr. Holdenreid at the Frances Simes Hastings Natural History Reservation.

Peromyscopsylla hemisphaerium Stewart, new species

Head. Most of the specimens at hand have three spine-like bristles in the row of bristles on the anterior margin of the frons, but some have three on one side and four on the other and others have four spine-like bristles on each side of the head. Lower frontal row composed of three bristles, the middle row of two widely separated bristles and the upper row of two bristles located above frontal spine-like bristles. With two spines in genal ctenidium; the lower one extending farther posteriorly than the upper. Labial palpus extending to about one-half the length of fore-coxae. Maxillae drawn out into a very fine point distally. *Thorax.* Pronotal ctenidium consisting of twenty-five or twenty-six (more commonly twenty-five) spines. With a row of about eight bristles anterior to pronotal ctenidium. *Abdomen.* The number of dorsal teeth on abdominal tergites variable but with teeth present on first five tergites. Posterior row of bristles on each abdominal tergite extending below stigma. Males usually with three antepygial bristles on each side of abdomen, but some with three on one side and four on the other and others with four on each side. When there are four antepygial bristles on each side, the next to the upper bristle is by far the longest and the upper bristle is slightly shorter than the lower bristle. When there are three antepygial bristles on a side, the middle bristle

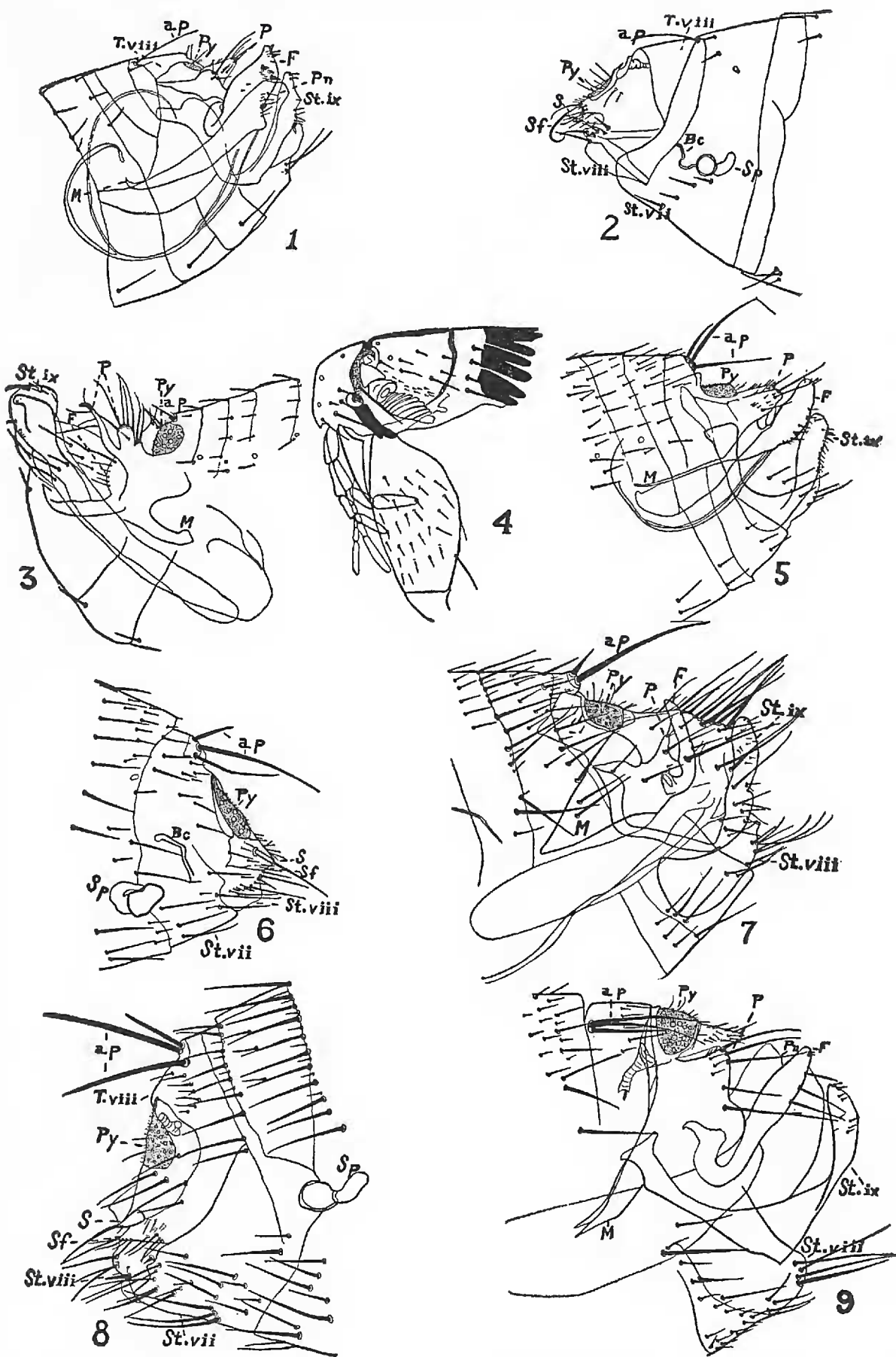
is the longest and the upper is the shortest. Females usually with four antepygial bristles on each side but sometimes with three on one side and four on the other. *Legs.* Metatibiæ with three long bristles in dorsal comb. A pair of medianly placed bristles inserted between first pair of lateral plantar bristles on last tarsal segment of all legs. *Modified Segments.* Male. Movable process of claspers hemispherical in outline and bearing three long and three shorter bristles on posterior margin (Fig. 16). Immobile process broadly rounded anteriorly and reaching to apex of movable process. Ninth sternite narrow and sharply curved dorsad at tip, which is acutely pointed; bearing very numerous fine bristles on ventral margin. Vertical arm of this sternite with an acute anterior process in its upper third and terminating proximally in a sharp point. Manubrium long, straight and slender and greatly narrowed towards the tip. Female. Stylet about twice as long as broad at base; narrowed towards apex and with one long apical and one ventral subapical bristle. Substylar flap very heavily bristled ventro-posteriorly. Head of spermatheca elliptical and tail long and vermiform (Fig. 17). Bursa copulatrix with a bulbous termination. Eighth tergite bearing a vertical row of four spines. Posterior margin of seventh sternite variable in outline; most of our specimens with a semi-rounded ventral lobe and a deep regularly concave sinus separating it from a prominent evenly rounded upper lobe. Occasionally this sternite is not posteriorly incised at all and in one specimen the ventral lobe has a prominent, triangular, almost tooth-like, projection on its upper part.

The holotype, a male, was collected at the Frances Simes Hastings Natural History Reservation, near Jamesburg, Monterey County, California, from *Peromyscus truei* subsp. on January 10, 1939, and the allotype from the same place and same host species on January 5, 1939, by R. Holdenreid. The paratypes consist of sixteen males and twenty females taken from *Peromyscus boylii* subsp., *P. californicus* subsp., *P. truei* subsp., *Microtus californicus* subsp., and *Reithrodontomys megalotis* by Mr. Holdenreid and C. P. North at the Frances Simes Hastings Natural History Reservation.

The author is indebted to Dr. J. M. Linsdale, who is in charge of the research work being conducted at the Frances Simes Hastings Natural History Reservation, for submitting the specimens described above.

LEGEND FOR FIGURES

Ap—antepygial bristles; Bc—bursa copulatrix; F—movable process of claspers; M—manubrium; P—immobile process of claspers; Pn—penis; Py—pygidium; S—stylet; Sf—substylar flap; Sp—spermatheca; St.vii—seventh sternite; St.viii—eighth sternite; St.ix—ninth sternite; T.viii—eighth tergite.



Figs. 1 and 2, male and female, *Anomiopsyllus congruens*, n. sp.; 3, male of *Hoplopsyllus tenuidigitus*, n. sp.; 4 and 5, male, and 6, female, *Atheropsylla bakeri*, n. sp.; 7 and 8, male and female, *Foxella ignotus acutus*, n. subsp.; 9, male of *Atyphloceras longipalpus*, n. sp.

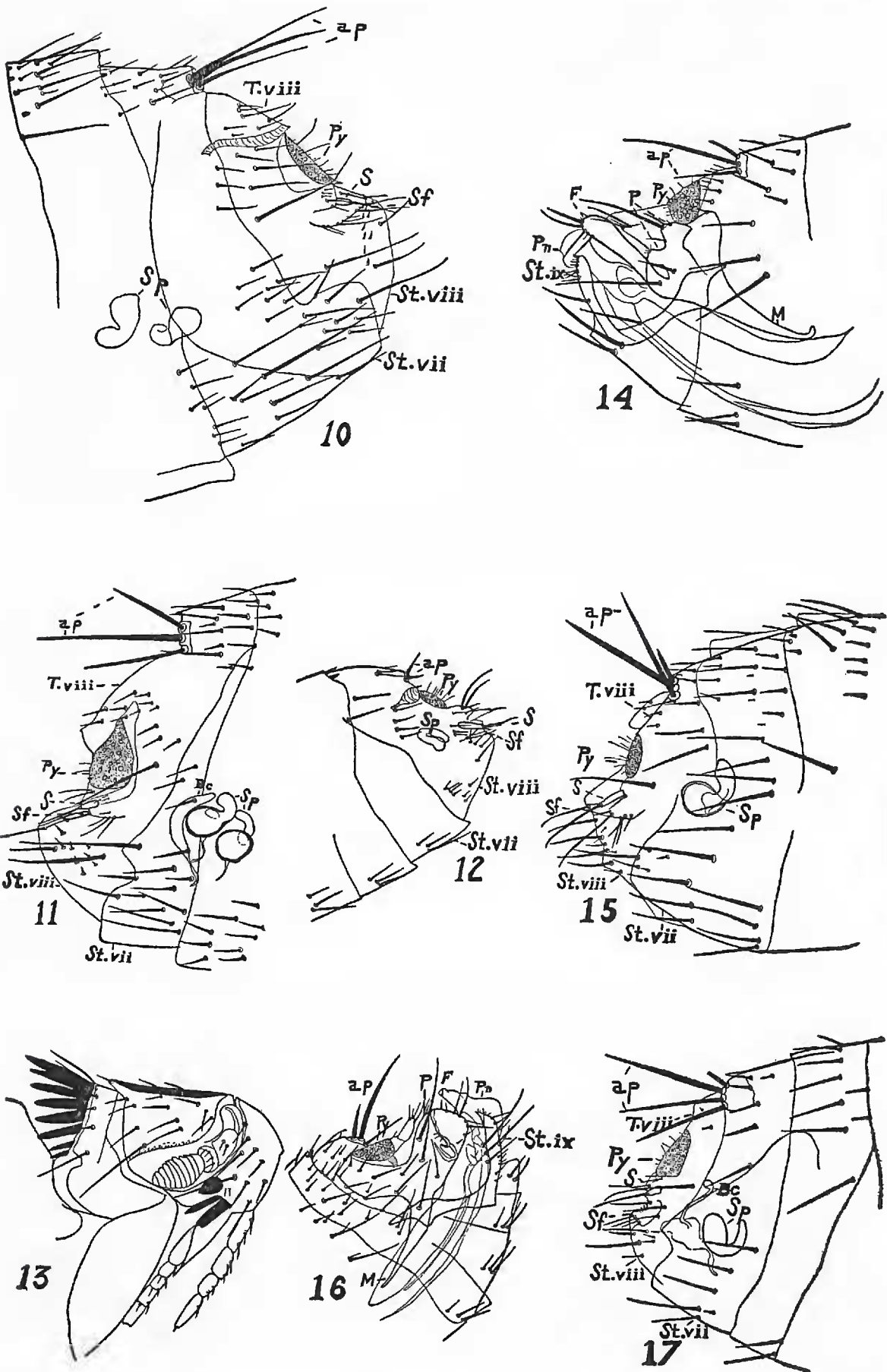


Fig. 10, female of *Atyphloceras longipalpus*, n. sp.; 11, female of *Atyphloceras felix* Jordan; 12, female of *Corypsylla setosifrons*, n. sp.; 13 and 14, male, and 15, female, *Trirachipsylla digitiformis*, n. sp.; 16 and 17, male and female of *Peromyscopsylla hemisphaerium*, n. sp.